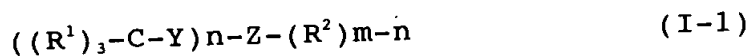


## CLAIMS

1. A catalyst for polymerization of olefins, which comprises:

- (A) a transition metal compound,
- (B) an oxygen-containing compound,
- (C) a compound of a general formula (I-1):



wherein  $R^1$  represents an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group,  $R^1$ 's may be the same or different, and  $R^1$ 's may be optionally bonded to each other to form a cyclic structure; Y represents an element of Group 16; Z represents a metal element of Groups 2 to 13;  $R^2$  represents a hydrocarbon group; m is an integer, indicating the valency of the metal element Z; and n is an integer of from 1 to (m-1),

and optionally,

- (D) an alkylating agent.

2. The catalyst as claimed in claim 1 for polymerization of olefins, wherein, in (C), Y is oxygen and Z is aluminium.

3. The catalyst as claimed in claim 1 for



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(C1) a compound of a general formula,  $(R^1)_3-C-OR^3$ :

wherein  $R^1$  represents an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group,  $R^1$ 's may be the same or different, and  $R^1$ 's may be optionally bonded to each other to form a cyclic structure;  $R^3$  represents a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group,

(C2) a compound of a general formula,  $Z(R^2)_m$ ,

wherein  $Z$  represents a metal element of Groups 2 to 13;  $m$  is an integer, indicating the valency of the metal element  $Z$ ; and  $R^2$  represents a hydrocarbon group,

and optionally,

(D) an alkylating agent.

500A, > 5. The catalyst for polymerization of olefins as claimed in any of claims 1 to 4, wherein at least one of three

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R<sup>1</sup>'s is an aromatic hydrocarbon group having from 6 to 30 carbon atoms.

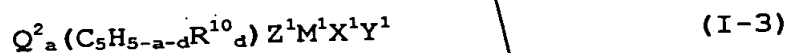
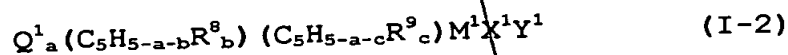
6. The catalyst for polymerization of olefins as claimed in any of claims 1 to 4, wherein three R<sup>1</sup>'s are all aromatic hydrocarbon groups each having from 6 to 30 carbon atoms.

7. The catalyst for polymerization of olefins as claimed in any of claims 1 to 4, wherein three R<sup>1</sup>'s are all phenyl groups.

8. The catalyst for polymerization of olefins as claimed in any of claims 1 to 7, wherein R<sup>2</sup> is an alkyl group having at least 2 carbon atoms.

9. The catalyst for polymerization of olefins as claimed in any of claims 3 to 8, wherein Z is aluminium.

10. The catalyst for polymerization of olefins as claimed in any of claims 1 to 9, wherein the transition metal compound (A) is represented by any of the following general formulae (I-2) to (I-6):



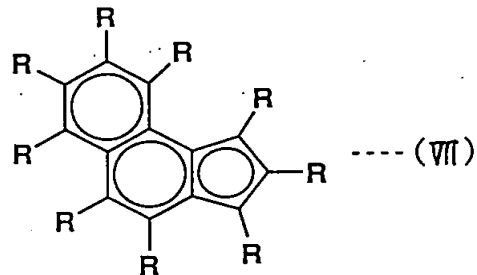
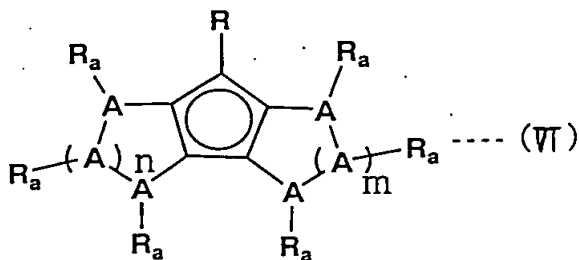
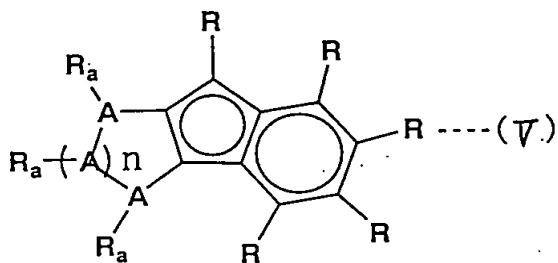
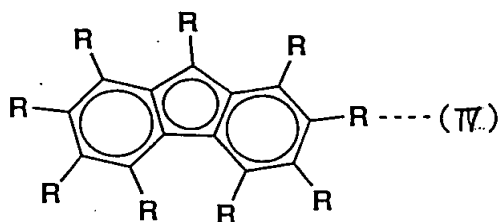
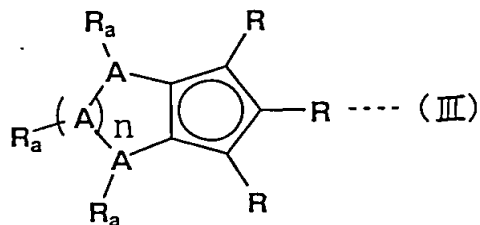
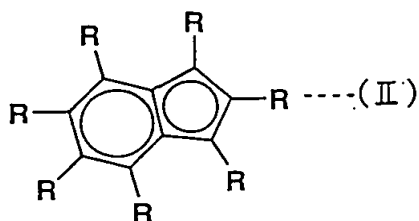
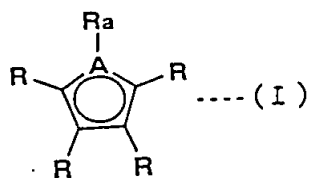
in which Q<sup>1</sup> represents a bonding group that crosslinks the two conjugated five-membered cyclic ligands (C<sub>5</sub>H<sub>5-a-b</sub>R<sup>8</sup><sub>b</sub>) and

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END  
A,

$(C_5H_5-a-cR^9_c)$ ;  $Q^2$  represents a bonding group that crosslinks the conjugated five-membered cyclic ligand  $(C_5H_5-a-dR^{10}_d)$  and the group  $Z^1$ ;  $R^8$ ,  $R^9$ ,  $R^{10}$  and  $R^{11}$  each represent a hydrocarbon group, a halogen atom, an alkoxy group, a silicon-containing hydrocarbon group, a phosphorus-containing hydrocarbon group, a nitrogen-containing hydrocarbon group, or a boron-containing hydrocarbon group; and a plurality of these groups, if any, may be the same or different, and may be bonded to each other to form a cyclic structure;  $a$  represents 0, 1 or 2;  $b$ ,  $c$  and  $d$  each represent an integer of from 0 to 5 when  $a = 0$ , or an integer of from 0 to 4 when  $a = 1$ , or an integer of from 0 to 3 when  $a = 2$ ;  $e$  is an integer of from 0 to 5;  $M^1$  represents a transition metal of Groups 4 to 6 of the Periodic Table;  $M^2$  represents a transition metal of Groups 8 to 10 of the Periodic Table;  $L^1$  and  $L^2$  each represent a coordination-bonding ligand;  $X^1$ ,  $Y^1$ ,  $Z^1$ ,  $W^1$  and  $U^1$  each represent a covalent-bonding or ionic-bonding ligand; and  $L^1$ ,  $L^2$ ,  $X^1$ ,  $Y^1$ ,  $Z^1$ ,  $W^1$  and  $U^1$  may be bonded to each other to form a cyclic structure.

11. The catalyst for polymerization of olefins as claimed in claim 10, wherein, in the transition metal compound (A) of formula (I-4), the group  $(C_5H_5-aR^{11}_e)$  is represented by any of the following general formulae (I) to (VII):



wherein A represents an element of Group 13, 14, 15 or 16, and plural A's may be the same or different; R represents a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from

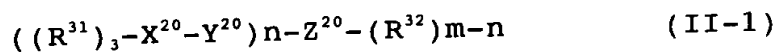
6 to 30 carbon atoms, an amino group, an amido group, a carboxyl group, or an alkylsilyl or alkylsilylalkyl group having from 3 to 30 carbon atoms, and R's may be the same or different, and may be optionally bonded to each other to form a cyclic structure; a represents 0, 1 or 2; and n and m each represent an integer of at least 1.

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A<sub>2</sub> >  
12. A method for producing olefinic polymers, which comprises polymerizing olefins in the presence of the polymerization catalyst of any of claims 1 to 11.

13. A catalyst for polymerization of olefins, which comprises:

(A) a transition metal compound,  
(B) a compound capable of reacting with a transition metal compound to form an ionic complex,

(C) a compound of a general formula (II-1):



wherein R<sup>31</sup> represents a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group, R<sup>31</sup>'s may be the same or different, and R<sup>31</sup>'s may be optionally bonded

to each other to form a cyclic structure;  $X^{20}$  represents an element of Group 14;  $Y^{20}$  represents an element of Group 16;  $Z^{20}$  represents a metal element of Groups 2 to 13;  $R^{32}$  represents a hydrocarbon group;  $m$  is an integer, indicating the valency of the metal element  $Z^{20}$ ; and  $n$  is an integer of from 1 to  $(m-1)$ ,

and optionally,

(D) an alkylating agent.

14. The catalyst for polymerization of olefins as claimed in claim 13, wherein, in (C),  $Y^{20}$  is oxygen and  $Z^{20}$  is aluminium.

15. The catalyst for polymerization of olefins as claimed in claim 13, wherein the compound (C) is a reaction product of a compound of a general formula,  $(R^{31})_3-C-OR^{33}$ , and a compound of a general formula,  $Z^{20}(R^{32})_m$ :

in which  $R^{31}$  represents a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group,  $R^{31}$ 's may be the same or different, and  $R^{31}$ 's may be optionally bonded to each other to form a cyclic structure;  $Z^{20}$  represents





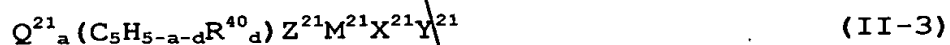
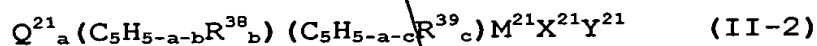


19. The catalyst for polymerization of olefins as claimed in any of claims 13 to 16, wherein three R<sup>31</sup>'s are all phenyl groups.

20. The catalyst for polymerization of olefins as claimed in any of claims 13 to 19, wherein R<sup>32</sup> is an alkyl group having at least 2 carbon atoms.

21. The catalyst for polymerization of olefins as claimed in any of claims 15 to 20, wherein Z is aluminium.

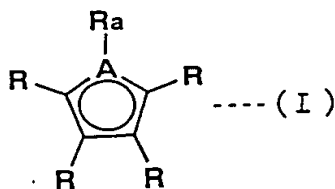
22. The catalyst for polymerization of olefins as claimed in any of claims 13 to 21, wherein the transition metal compound (A) is represented by any of the following general formulae (II-2) to (II-6):

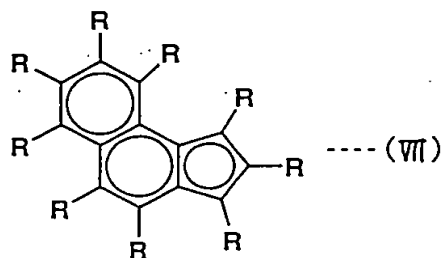
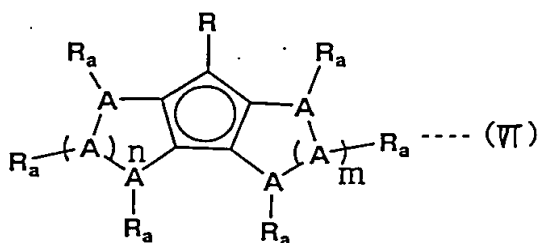
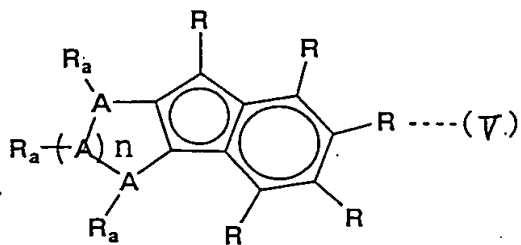
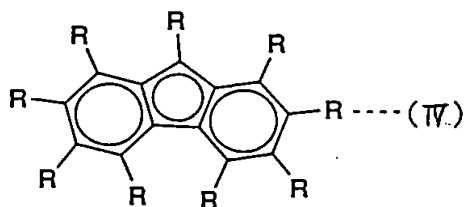
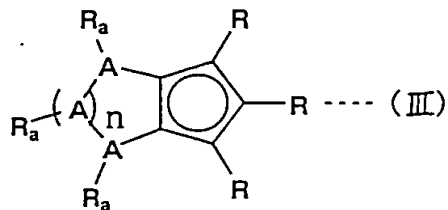
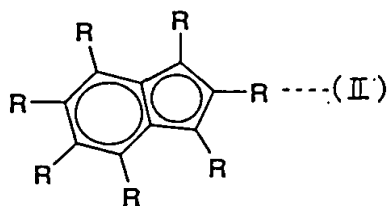


in which Q<sup>21</sup> represents a bonding group that crosslinks the two conjugated five-membered cyclic ligands (C<sub>5</sub>H<sub>5-a-b</sub>R<sup>38</sup><sub>b</sub>) and (C<sub>5</sub>H<sub>5-a-c</sub>R<sup>39</sup><sub>c</sub>); Q<sup>22</sup> represents a bonding group that crosslinks the conjugated five-membered cyclic ligand (C<sub>5</sub>H<sub>5-a-d</sub>R<sup>40</sup><sub>d</sub>) and the group Z<sup>21</sup>; R<sup>38</sup>, R<sup>39</sup>, R<sup>40</sup> and R<sup>41</sup> each represent a hydrocarbon group, a halogen atom, an alkoxy group, a silicon-containing hydrocarbon group, a phosphorus-containing hydrocarbon group, a nitrogen-

containing hydrocarbon group, or a boron-containing hydrocarbon group; and a plurality of these groups, if any, may be the same or different, and may be bonded to each other to form a cyclic structure; a represents 0, 1 or 2; b, c and d each represent an integer of from 0 to 5 when a = 0, or an integer of from 0 to 4 when a = 1, or an integer of from 0 to 3 when a = 2; e is an integer of from 0 to 5;  $M^{21}$  represents a transition metal of Groups 4 to 6 of the Periodic Table;  $M^{22}$  represents a transition metal of Groups 8 to 10 of the Periodic Table;  $L^{21}$  and  $L^{22}$  each represent a coordination-bonding ligand;  $X^{21}$ ,  $Y^{21}$ ,  $Z^{21}$ ,  $W^{21}$  and  $U^{21}$  each represent a covalent-bonding or ionic-bonding ligand; and  $L^{21}$ ,  $L^{22}$ ,  $X^{21}$ ,  $Y^{21}$ ,  $Z^{21}$ ,  $W^{21}$  and  $U^{21}$  may be bonded to each other to form a cyclic structure.

23. The catalyst for polymerization of olefins as claimed in claim 22, wherein, in the transition metal compound (A) of formula (II-4), the group  $(C_5H_{5-e}R^{41}_e)$  is represented by any of the following general formulae (I) to (VII):





wherein A represents an element of Group 13, 14, 15 or 16, and plural A's may be the same or different; R represents a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, a carboxyl group, or an alkylsilyl or alkylsilylalkyl group having from 3 to 30 carbon atoms, and R's may be the same or different, and may be optionally bonded to each other

to form a cyclic structure; a represents 0, 1 or 2; and n and m each represent an integer of at least 1.

24. A method for producing olefinic polymers, which comprises polymerizing olefins in the presence of the polymerization catalyst of any of claims 13 to 23.

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